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ABSTRACT

This manual presents guidelines for defining and detailing the use of computers in education and provides a basic model for introducing, implementing and evaluating computer technology in schools, including issues related to equity. Chapter 1 provides a brief overview of the impact of computers on education and a list of principles for implementing their use in schools. Chapter 2 presents a model for computer use in education, including guidelines for teaching about computers and programming, for computer-assisted learning (CAI), and for computer-managed instruction (CMI), and a model for utilizing computers in educational administration. Planning for the introduction of computers in K-12 instruction is outlined in chapter 3, and chapter 4 describes the process for implementing a district plan, including guidelines for staff development; software and hardware selection, acquisition, and management; and program integration. A chart suggesting the scope and sequence of computer education is included, and indicates possible grade spans for introductory, developmental, and review activities. Chapter 5 provides a list of questions that may be helpful in evaluating and/or modifying the district plan. The appendices include a summary of equity issues forms for courseware and hardware evaluation. (DJR)

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WISCONSIN GUIDELINES

Instructional Computer Use In Education K-12

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WISCONSIN GUIDELINES

FOR INSTRUCTIONAL COMPUTER USE IN EDUCATION

K-12

STATE OF WISCONSIN
DEPARTMENT OF PUBLIC INSTRUCTION

January 1985

FIRST EDITION

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PREFACE

Educators at local, regional, and state levels are making decisions daily about advancing the use of computer technology in the schools. They have an immediate need for information that provides perspectives and useful alternatives concerning the roles of computers in education.

The Wisconsin Guidelines for Instructional Computer Use in Education in its first edition was preceded by a working draft developed and field tested during the 1983-84 school year. Many comments and suggestions from interested educators have helped to refine and extend the guidelines as they are now presented. They are designed to provide a basic model for dealing with a pervasive new technology at the local level. The Department of Public Instruction's Computers in Education Committee, which developed the guidelines, also recognizes the need for supplemental monographs on the use of computers in various subject areas, and teaching units and activities to accompany the various elements of the computers in education model. These will be developed and published as needs and practices in local school districts are identified and as the state of the art in computer education evolves.

The Computers in Education Committee wholeheartedly recommends that staff in all disciplines within the public schools of Wisconsin answer the challenge presented and begin using the contemporary tools of technology, specifically the computer, as an integral part of all instructional programs. The content of these guidelines will define and detail the use of computers in education, and provide a sound base for the integration of computer technology within all disciplines.

Knowledge of the computer is basic to an understanding of the full range of procedures that may be applied to organizing information and solving problems in fields as diverse as mathematics, science, the social sciences, language, the creative arts, business, and industry.

Integrating computers into the school curriculum can expand educational opportunities for all students. However, without particular attention to equity issues, the computer revolution has the potential to widen the gap between advantaged and disadvantaged, male and female, majority and minority students. The committee and the Department of Public Instruction are committed to preventing this. To that end, items that address equity issues have been included in the checklist for evaluating software; there is also an article in the appendix designed to heighten educators' awareness of how pervasive their concern for equity must be. (See Appendix A)

The guidelines are intended to supplement a series of curricular documents relating to academics, humanities, and vocational areas of study planned by the Department of Public Instruction for publication in 1985. They are also intended to support districts developing their own computer education plans.

It is appropriate to acknowledge and thank members of the Computer Education Subcommittee for the time, support, and assistance they provided in producing the computers in education model and this guide:

J. Terry Downen	Principal, Owen-Withee Senior High School
Rollie Hicks	Director, Northwest Computer Support Center, CESA #10; Coordinator, Wisconsin Instructional Computing Consortium, Chippewa Falls
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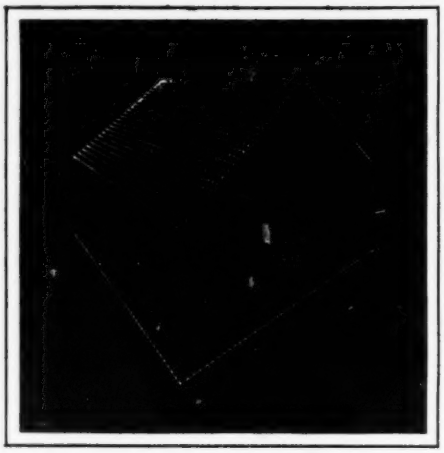
Sharon Martin	K-8 School Librarian, Prairie du Chien Public Schools; Co-Coordinator, District Computer Committee
Berland Meyer	Director of Instructional Computing, Wausau School District
Janice Patterson	Director of Computer Operations, Wisconsin Center for Education Research, School of Education, University of Wisconsin-Madison
Robert Patton	District Computer Education Coordinator, Mequon-Thiensville Public Schools

Department of Public Instruction members of the committee:

M. Elaine Anderson, Co-chair	Supervisor, Microcomputers and Instructional Technology, Bureau for Instructional Media and Technology, Division for Library Services
Eunice Bethke, Co-chair	Chief, Curriculum Development Section, Bureau for Program Development, Division for Instructional Services

We would also like to acknowledge the work of many school districts in the state, in particular Owen-Withee, Mequon-Thiensville, Lake Mills, Appleton, and Prairie du Chien, which helped with development of this document.

CHAPTER I



PERSPECTIVES

Computers are becoming increasingly widespread tools in most occupations. As a result, the need to prepare all students, not just advanced math and science students, for a future with computers becomes more and more urgent. The goal of computer education, then, is to expose all students to computers and computer applications in a variety of curriculum areas.

Since computers and other electronic technologies are having a revolutionary effect on society, educational needs have changed, and will continue to change drastically. Skills and competencies once deemed essential to success in this society have become far less important in the present electronic age. As a result, if schools are to continue to play a major role in providing equal opportunities, significant changes must be made in all curricular areas.

Several applications of computers provide indications of how previously important skills can become less significant and lead to questions which must be addressed by educators.

1. What effect will widespread use of word processing and electronic spreadsheet programs have on the need to spend a significant amount of time teaching penmanship skills?

2. What effect will widespread use of calculators and programmable computing devices have on the need to spend nearly eight years teaching computation skills?

3. What effect will widespread access to comprehensive information retrieval services have on the need to teach factual information in all curricular areas?

In general, success in the electronic age will be less dependent on rote mechanical skills than on higher-level thinking and creative skills.

Elementary and secondary schools must question the relevance of the content of instructional programs in all curricular areas. They must look, not to a movement "back to the basics," but forward to the needs of future citizens. Curriculum content must be continually reviewed and changed.

A major portion of the experience of today's children involves electronic communication devices such as televisions, computers, and video games. These are the "natural" tools of their time. In contrast, previous generations were more print-oriented and, as a result, more receptive to learning through print media. Educational effectiveness can be significantly increased with greater use of electronic educational tools that take students beyond traditional curriculum and learning activities to future-oriented curricula and problem-solving activities not previously available.

Effective implementation of computer use in the schools should be based on the following principles.

1. Computers should be introduced into the curriculum with an orderly and well-defined plan.

2. Students of all ability levels, genders, races, handicaps, and ethnic groups can and must use computers.

3. Districts should make a commitment to computer literacy as a basic skill for all students.

4. Implementation of an effective computer plan requires sufficient district resources to support staff development, curriculum development, and software and hardware acquisition.

5. All classroom teachers are capable of using the computer as an instructional tool. Adequate staff development programs must be provided to ensure the effective use of computers in education.

6. Computers should be considered superior instructional tools in some situations and inferior ones in others. The versatility of computers allows them to provide instructional support in all disciplines.

7. Computers should support instructional management through success prediction, monitoring of student progress, vocational guidance, and education and career planning.

8. Computers allow teachers to concentrate on student needs and learning problems, and to become more effective facilitators of learning.

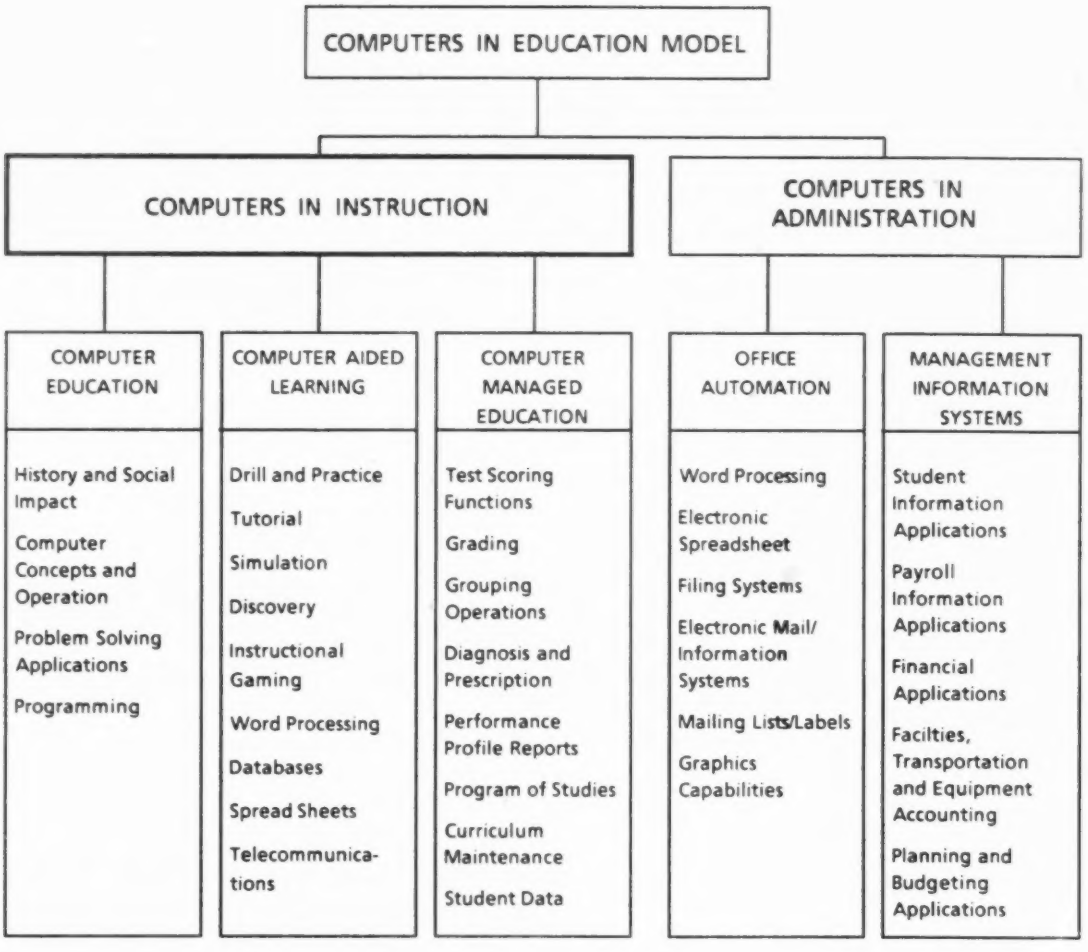
9. Computers should be made available in sufficient numbers so that students will have adequate opportunities to develop basic computer operation skills and to feel comfortable using the computer as a learning and problem-solving tool.

10. The rapidly evolving nature of information technology demands constant awareness and revision of current practice to realize the computer's potential as a learning tool.

A major emphasis of a computers-in-education program must be on the computer as a problem-solving tool. Educators must be cognizant of the possibilities of using the capabilities of the computer to develop higher levels of thinking: analysis, synthesis, and evaluation. The computer offers the opportunity for decision-making experiences for students and for their active involvement in learning and the selection of learning activities, not merely passive reception of predesigned activities. It can offer the opportunity for creative, rather than conforming, student behavior if school districts study and consider carefully the possibilities afforded by computer technology.

CHAPTER 2

MODEL FOR COMPUTER USE IN EDUCATION



A. COMPUTERS IN INSTRUCTION

The computers-in-education model introduces the use of computers in instruction and in administration. The model is intended to help educators teach the computer as a subject of instruction and use the computer as a tool in teaching the school curriculum and an aid in the management of instruction. The model also provides an overview of the use of computers in administration. This topic is covered more thoroughly in DPI Bulletin No. 4907, Suggestions for Reviewing School District Administrative Data Processing Needs.

1. **Computer Education** – Computer education addresses the need to learn about the computer itself as a subject of instruction. Topics included in this strand are the impact of the computer on individuals and society, computer definition and terminology, and how computers can be utilized or programmed to analyze and generate solutions to real-world problems.

   History and Social Impact – Should provide exposure to the historical development of the computer and its role in present day society. Computers touch everyone's life and students should be made aware of some of these sundry applications. Careers that require computer use should also be highlighted.

   Societal, legal, and ethical issues pertaining to computer use must be dealt with in addition to the educational issues. Finally, time must be given for a look to the future. The implications for the computer's role in artificial intelligence, robotics, telecommunications, and the like are important topics for discussion.

   These topics can and should be handled wherever appropriate in all the curricula taught in the school.

   Computer Concepts and Operations – Involves the following three areas:

   a. the understanding of common words helpful in computer environments;

   b. the ability to identify and know key hardware components, their functions, capabilities, limitations, and relationships to software;

c. experience using the computer keyboard–sound generation, graphics; using software–inputting, outputting, and saving data.

Problem-Solving Applications – Involves understanding the problem-solving process, selecting the appropriate tool, perhaps a computer, and finding and using the applicable software.

The applications fall into two broad areas:

a. working within the computer system with such software as electronic spreadsheets, information retrieval systems, word processing programs, and so on;

b. using the computer to interface with external devices to control or to collect data such as CAD/CAM (Computer-Assisted Design/Computer-Assisted Manufacture), robotics, timing and measuring devices, environmental controller, and so on.

Programming – Communicating with programmable devices so that they will react to users' requests. This is accomplished by developing algorithms, designing flow charts, coding information in a format the machine understands, entering the information, and debugging the program. Computer programming instruction teaches students the commands needed to communicate using a computer language (Logo, BASIC, Pascal):

Logo – a discovery-oriented, structured language used when the computer is to be a device to help students think, experiment, and discover.

BASIC – the language most readily available for student use, as it is built into the majority of computers sold for home and school use.

Pascal – the structured, procedure-oriented language that is the basis for the advanced-placement computer curriculum.

A district may also provide instruction in the Fortran, Cobol, Assembler, and machine languages. Additional topics may include the study of computer systems, systems design, and design logic.

2. **Computer-Aided Learning** provides an opportunity to use computer programs as effective instructional tools in the same way other media are used. The computer becomes an instructional tool for drill and practice, inquiry, problem solving, tutoring for remediation, initial teaching, enrichment, and learning reinforcement in many areas of the curriculum. Well-developed computer software can add dynamic and interactive versatility to the learning process.

   Drill and Practice – programs that review and reinforce concepts or skills already taught.

   Tutorial – programs that introduce, explain concepts and facts; may provide initial exposure to materials.

   Simulation – programs designed to model real-world enrivonments with which students can investigate areas of mathematics, social studies, ecology, physics, chemistry, and so on. Simulations allow students to make decisions and interact in situations that are often too complex, historical, expensive, dangerous, or distant to be brought into the classroom.

   Discovery – computer programs used to develop cognitive abilities in problem solving and specific subject areas such as math, language arts, social studies, and others.

   Instructional Gaming – games designed to hold a user's attention and interest while teaching logical thinking or making practice less tedious.

   Word Processing – use of the computer and specialty software which supports the writing, editing, formatting, and printing of reports and other written documents.

   Data Bases – use of the computer to collect, organize, retrieve, sort, display and print data of all kinds.

   Spreadsheets – use of the computer and specialized software to simulate a business or scientific worksheet. Data entered into "cells" in the elect worksheet can be calculated automatically by the spreadsheet program.

   Telecommunications – use of the computer and communcations software to input, transmit, sort, receive, and display information from various sources.

C. **Computer-Managed Education** – the computer is used as a manager of instruction and of the educational setting.

There is a wide variety of computer managed education software. A large subset of software is subject oriented and is often referred to as CMI (Computer-Managed Instruction). For example, students can complete a paper test at their seats, and a card reader can score it automatically, entering grade data into the computer. The computer can then diagnose areas of weakness and suggest prescriptions of various textbooks or other non-computer media. The teacher must select the most appropriate assignment, which the computer then records in that student's record.

In addition to CMI software, there is another subset of software that deals with related specific tasks.

Test-scoring functions – Machines called card readers or scanners are attached to the computer. Students' answer sheets are machine scored and the resulting data is put into computer memory.

Grading – Once test data is entered by hand or machine, it is graded according to the teacher's guidelines, and grades are placed in each student's computer file.

Grouping operations – Based on test scores, recommendations for dynamically forming and reforming groups for instruction can be provided.

Diagnosis and prescription suggestions – The computer evaluates student progress and, knowing the curriculum objectives and the relevant school resources, makes prescription suggestions for teacher selection.

Performance profile reports – Individual or group student progress can be selected across any set of objectives.

Program of studies – This function enables a specific set of objectives to be tracked across many subject areas. This can be very useful when individual education plans (IEPs) are required.

Curriculum maintenance – Districts' goals and objectives for students change over time, so the computer program allows additions to, delections from, and modifications of curriculum and resource data.

Student data – Lists of student data can be generated: students by home room, telephone numbers by class, and lists of addresses, emergency medical data, etc.

Implementation of CMI requires a considerable committment of staff time and district resources. It is wise to consider carefully the following questions before proceeding with a CMI project.

What level of implementation do you desire: single classroom, multi- classroom, or district-wide?

What amount of inservice training is necessary to begin?

Do you want to work with objectives created commercially, modify them, or build your own data base?

How much time is necessary for preparation?

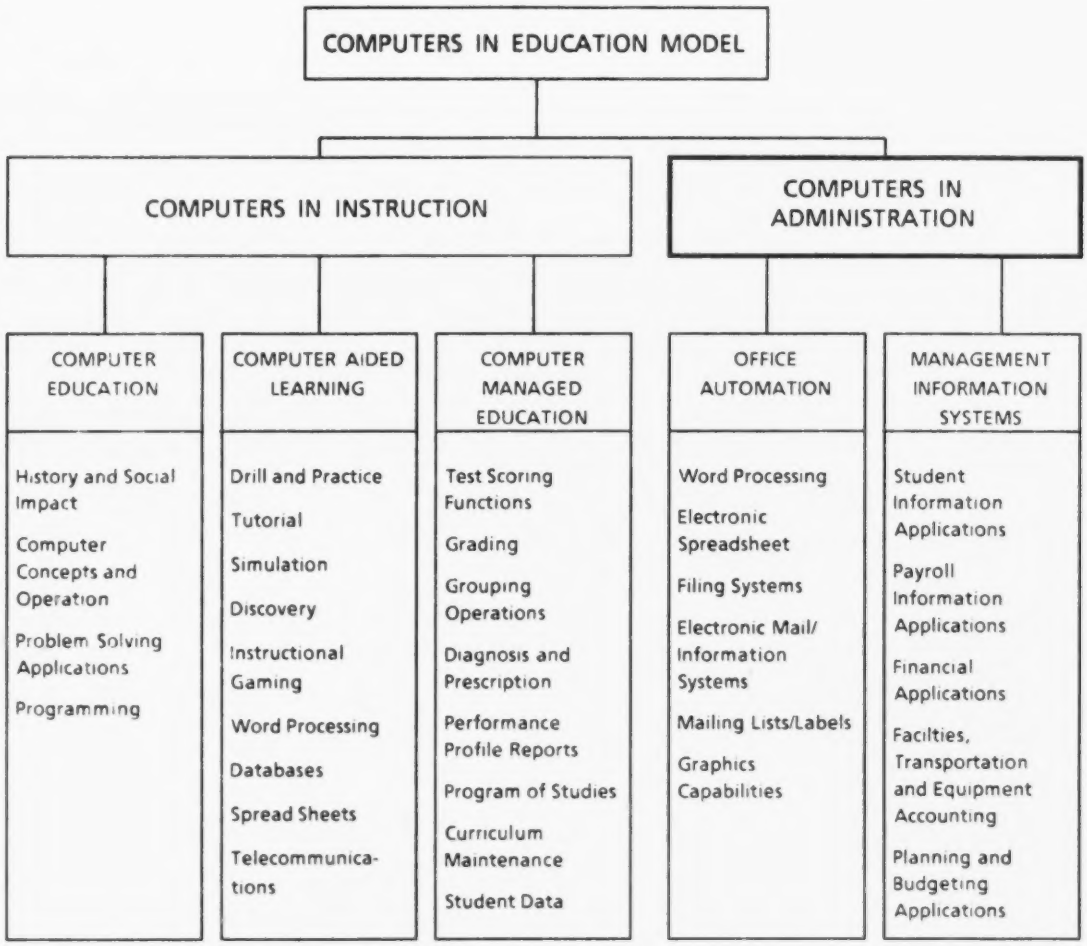
How often will you evaluate and modify the data base to make sure it meets current instructional needs?

Do those persons implementing the program have an investment in its success?

Do you have data from a pilot project that can be used to estimate expenses if you expand the scope of your efforts?

Does your staff know the advantages and disadvantages of bringing in a computer? Did the staff make the final determination on the degree of computer involvement?

B. COMPUTERS IN ADMINISTRATION



In Office Automation and Management Information Systems, the computer is used as a tool to help in situations where:

a. massive amounts of data are processed through well-defined operations,

b. processing is repetitive,

c. processes are repeated many times under a variety of conditions,

d. processing speed is important.

Numerous administrative functions within a school district fit into one or more of these categories. The desire and necessity for information at both the local and state levels have dramatically increased the interest in administrative computer applications.

Some further examples of management information system applications are:

Student Information Applications
- Scheduling
- Grading
- Attendance
- Exceptional Education Data

Personnel Information Applications
- Payroll
- Personnel Data (e.g. certification, fringe benefits, seniority)
- Negotiations

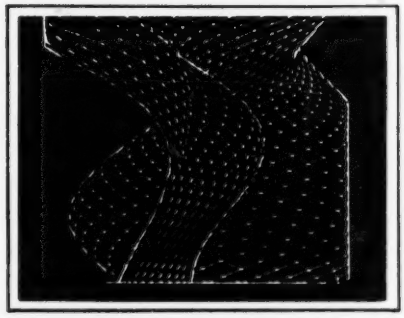
Financial Applications
- Accounting
- Investing/Borrowing

Facilities, Transportation, and Equipment Accounting
- Bus Routing
- Inventory/Fixed Assets
- Building/Vehicle/Equipment Maintenance

Planning and Budgeting Applications
- Census
- Budget Development.

The Department of Public Instruction offers Bulletin No. 4907, "Suggestions for Reviewing School District Administrative Data Processing Needs." It was designed by the Division for School Financial Resources and Management Services to help districts assess their data processing needs, consider alternatives, plan for installation and implementation of the computer system, and review performance of the system. The process outline is designed to serve those districts investigating their first computerized system as well as those considering a transition from one system to another.

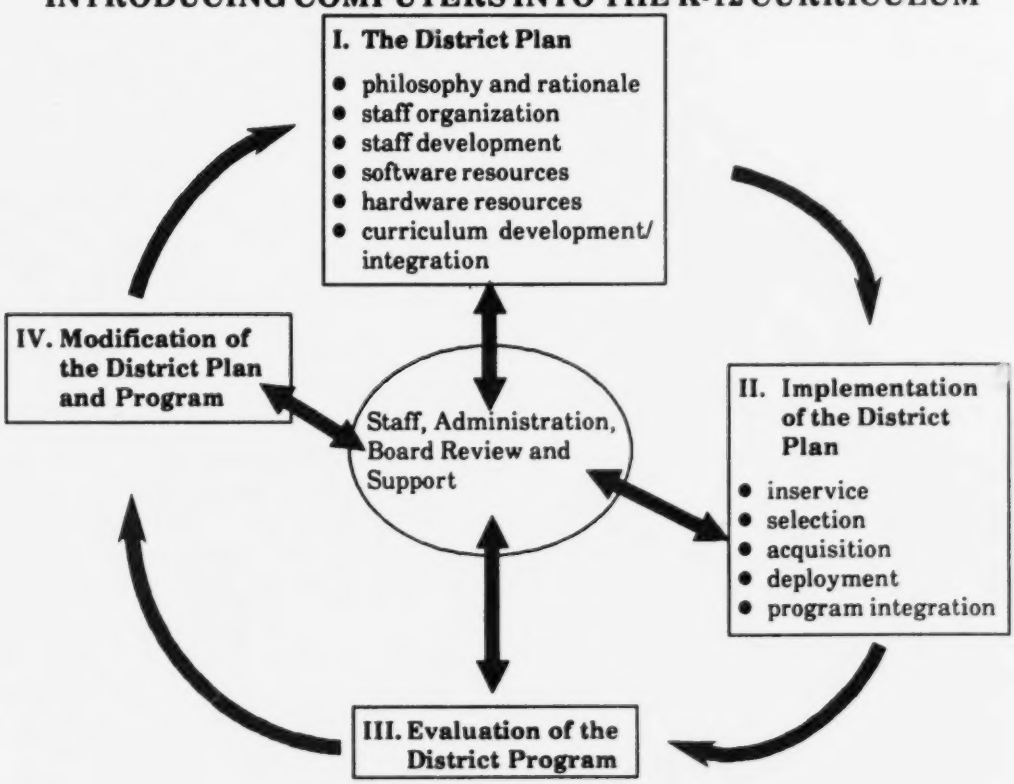
CHAPTER 3



PLANNING FOR INTRODUCING COMPUTERS IN K-12 INSTRUCTION

Decisions about the use of computers in education should be based on a carefully written plan. The plan should encompass all of the current and projected uses of computers within the district as outlined in the computers in education model in Chapter 2. The planning process should involve shared decision-making regarding all aspects of the district plan. The diagram shown below gives an overview of various points which must be considered in the development of a district plan and its implementation. The various sections of the diagram are discussed in Chapters 3, 4, and 5.

INTRODUCING COMPUTERS INTO THE K-12 CURRICULUM



A. THE PLANNING PROCESS

If instructional computing programs are to be implemented effectively, there must be a mechanism for establishing responsibility, for providing appropriate resources (materials, services, equipment), and for making decisions. If this mechanism does not exist, it will have to be created. Program development and implementation require community, school board, and administrative support, as well as broad-based staff commitment. The planning process should facilitate a synthesis of support for computers in education among these groups.

1. Assigning Responsibility

The first requirement is for the school administration to designate an individual who will assume major responsibility for district-wide planning and coordination of computers in instruction. Ideally, this person should be well trained and experienced in educational computing and curriculum planning and development. It is important for the coordination role to be delegated to someone who possesses skills in organization and whose leadership is accepted by the staff.

The person assigned as district computer coordinator must have the responsibility, as well as the authority, to call and conduct meetings, communicate freely with staff members, train staff members, and manage facilities.

2. Creating the Advisory Committee

Instructional program planning is a complex task which should not be vested in one individual regardless of personal qualifications; therefore, a second step is to appoint an instructional computing committee to coordinate the plan. The designated district computer coordinator should act as chair of the committee and serve as a liaison person within the district.

a. Structure

The computers in instruction advisory committee should be broadly representative of all groups to be affected by the integration of computers into the curriculum; it should include representatives from each building, various grade levels, disciplines, administration, the board of education, the community, and the student body. It is also important to include both genders, race representatives, and members of ethnic groups to help assure equal access to computers across the district.

The members of the committee may be selected from individuals who demonstrate:

- the ability and willingness to implement instructional computing, kindergarten through grade 12,
- knowledge of and interest in computers,
- willingness to provide leadership in the district, as well as at the building level,
- willingness to deal with philosophical and ethical issues, including equity issues.

Committee members should be appointed for a term long enough to insure continuity, with provision for new personnel to be appointed periodically.

b. Committee Responsibilities

The tasks of the computers in instruction advisory committee might include:

- formulating a K-12 district plan for integrating computers into the curriculum,
- implementing a computer training program for teachers, principals, and administrators,
- developing implementation plans,
- coordinating equipment use throughout the district,
- making budget recommendations,
- developing a process for revising the district plan and implementation procedures as needed,
- writing computer hardware and software acquisition, copy, and management policies,
- developing guidelines for access, i.e., use of computer hardware and software both on and off premises,
- reviewing and recommending appropriate articulation for curriculum proposals from other disciplines,
- setting long-term as well as yearly goals, and
- informing the community about the program.

c. Operational Procedures

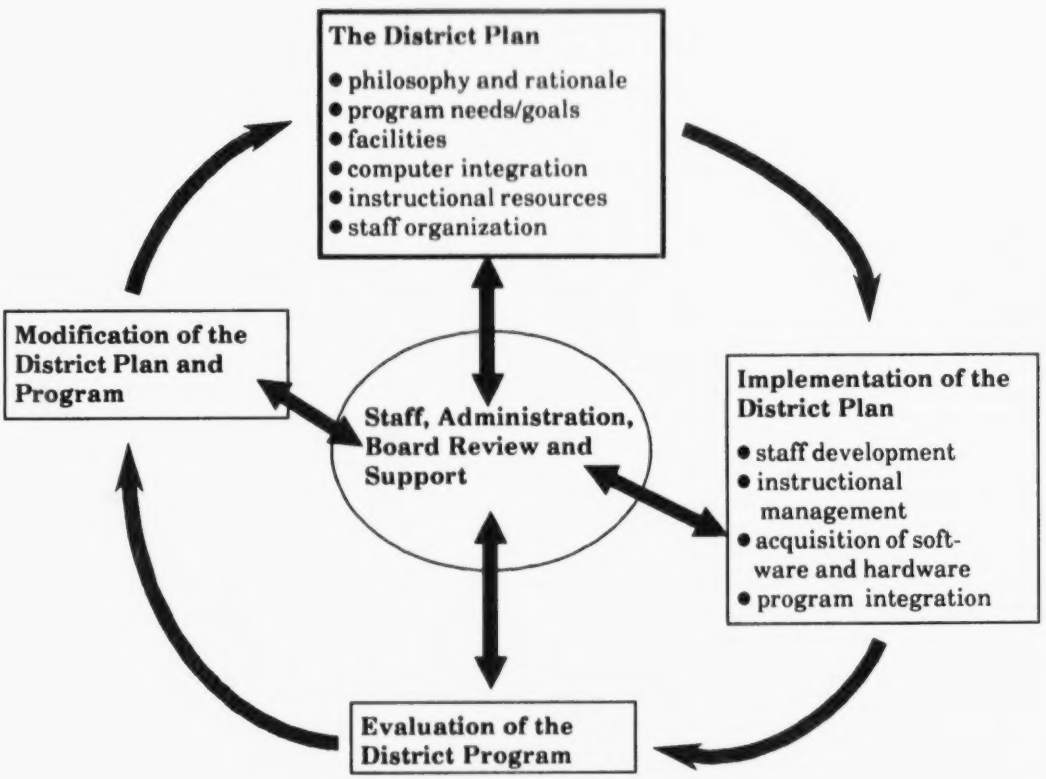
To insure its effectiveness, the computers in instruction advisory committee should have clearly defined operational procedures based on commonly accepted committee practices, including:

- a written agenda for each meeting,
- written minutes of each meeting,

- established time lines for committee projects,
- a procedure for delegating tasks to appropriate sub-committees,
- clearly identified roles/responsibility for the mission of the committee,

3. Educating the Computers in Instruction Advisory Committee

Because the committee will play a critical role in the decision-making process, it is essential that members have sufficient knowledge, insight, and experience to make informed decisions. Therefore, opportunities should be provided for all members to attain the highest degree of competence as specified in the staff development section of this document (See Chapter 4, p. 23). Adequate resources of both time and finances should be available to the committee.



B. THE DISTRICT PLAN

1. Philosophy and Rationale

Every educational program should be rooted in, and reflective of, a carefully considered educational philosophy. Therefore, when developing a plan for computers in education, a district must also establish a district philosophy regarding computer use. The following principles, among others, should be considered in preparing this philosophy:

a. Computers should be introduced into the curriculum with an orderly and well-defined plan.

b. Students of all ability levels, genders, races, handicaps, and ethnic groups can and must use computers.

c. Districts should make a commitment to computer education as a basic skill for all students.

d. Implementation of an effective computer plan requires sufficient district resources to support staff, curriculum, and faculty development.

e. All classroom teachers are capable of using the computer as an instructional tool. Adequate staff development programs must be provided to ensure the effective use of computers in education.

f. Computers should be considered superior instructional tools in some situations and inferior ones in others. The versatility of computers allows them to provide instructional support in all disciplines.

g. Computers should support instructional management through success prediction, monitoring of student progress, vocational guidance, and education and career planning.

h. Computers allow teachers to concentrate on student needs and learning problems, and to become more effective facilitators of learning.

i. Computers should be made available in sufficient numbers so that students will have adequate opportunities to develop basic computer operation skills and to feel comfortable using the computer as a learning and problem-solving tool.

j. The rapidly evolving nature of information technology demands constant awareness and revision of current practice to realize the computer's potential as a learning tool.

2. Program Needs/Goals

Identifying district instructional needs is important in developing a comprehensive plan for computers in instruction. The information gathered from assessing the present provides the essential background data for developing a plan for the future. Although there are many areas to be examined in the initial assessment process, some of the most pertinent requiring exploration are:

- student needs for the increased knowledge, conceptual base, and skills required to succeed in further education, employment, entertainment/ recreation, or other personal pursuits;
- teacher needs relating to improved instruction;
- school educational management and decision-making needs.

District-wide goals are statements of general purpose and intent to foster educational excellence. The goals for instructional computer use should provide guidance and direction in the three areas addressed by the computers in instruction model: computer education, computer-aided learning, and computer-managed education. The goals should reflect identified student, teacher, and school needs.

3. Facilities

Having surveyed the district's needs and having established program goals for the use of computers in instruction, the committee should next identify the facilities needed to achieve desired goals. These include:

- hardware deployment and location,
- hardware and peripherals, and
- space.

a. **Hardware Deployment and Location**

Computers should be located in buildings where they will provide the best access and the widest use. A number of options are available for computer placement.

Independent study

A computer can be placed for student use in the instructional media center (IMC), independent study area, or lab area.

Department/teacher use

Some departments (secondary) or schools (elementary) may need access to a computer system for teacher exploration/ experimentation, the authoring of computer-assisted instruction (CAI) programs, testing and evaluation, and so on. Others, such as guidance, may utilize a computer in work with students.

The "Traveler"

A mobile computer system can be made available for checkout to individual classrooms conducting a CAI or computer education unit.

Permanent assignment of a computer to a classroom

The curriculum may dictate this approach in some cases.

The computer lab

This could be an area housing a sufficient number of computers so that each student or every two students could have immediate access to a computer. This might be for single-discipline or for multi-discipline use.

The networked classroom computer lab

Such a lab would have computers networked to share software and peripherals.

The instructional/management computer

This computer would be used by the staff for management information system applications.

A combination of options may be chosen. Location choices should be based on the intended use of the hardware and on the best accessibility possible for students.

b. Hardware Selection

Assessing needs

A list of the district's present and future needs, in line with the capabilities of the computer, is a good place to start. It is important to remember in this assessment that in most cases a computer can only use the programs designed to run on that make or type of computer. So, if classroom instruction is the main use intended for the computer, it is necessary to investigate the available software BEFORE making a hardware decision. A hardware evaluation checklist appears in Appendix C.

c. Space

Issues to be considered when considering specific space or location for computer hardware include:

- ease and flexibility of access,
- supervision requirements,
- power requirements,
- cable and telephone access,
- consideration of human comfort and health factors relating to computer use (ergonomics),
- handicapped access,
- security considerations, and
- space in the classroom for individualized computer interaction.

4. Integrating Computers into the Curriculum

One of the most important roles of the Computers-in-Instruction Advisory Committee is to establish a plan which provides guidance for the use of computers for all three components of the computers in instruction section of the model, organization, computer education, computer-aided learning, and computer-managed education.

Computer-related instruction should be integrated into existing curricula through a change process involving shared decision making.

a. Computer Education Component

As defined in Chapter II, a computer education program should be designed to address the need to learn about the computer itself. The computer is the subject of instruction. A well-defined computer education unit would include topics related to history and social impact, computer concepts and operations, problem-solving applications, and programming. The following items must also be addressed: scope and sequence of learner outcomes; instructional strategies; integration with content area; instructional resources needed; and evaluation procedures.

b. Computer-Aided Learning Component

Computer-aided learning involves the use of the computer as an instructional tool. The computer should be used to

- support the teaching of content area skills, knowledge concepts,
- teach "real world" computer applications related to content areas, and
- teach about computer use in occupations related to content areas.

c. Computer-Managed Instruction Component

Instructional management is the process that controls the content, context, duration, and pace of instructional events. Districts should explore the potential of the computer to facilitate this process. Decisions about the use of computers for instructional management should be based on the following considerations:

- level of implementation desired: single classroom, multi-classroom, or district-wide;
- amount of staff training needed;
- use of objectives created commercially, modified locally, or created locally;
- time needed for preparation;
- continuous evaluation and modification of the data base to ensure that it meets current instructional needs;

- persons implementing the program; who should have an investment in its success;
- availability of data from a pilot project that can be used to estimate expenses if you expand the scope of your efforts;
- staff knowledge of the advantages and disadvantages of using computer; and
- involvement of staff in final determination of the degree of computer involvement.

5. **Software Resources**

Successful use of computers in instruction requires adequate and appropriate software resources. Instructional resource support should involve planning related to the following components:

- identification of needs,
- material identification, review, and evaluation,
- material acquisition, and
- management of resources (storage, calatoging, and dissemination).

These issues are dealt with in detail in Chapter 4.

6. **Staff organization**

Staffing decisions should address:

- leadership and coordination needs at both the district and building levels;
- staff support needs;
- instructional delivery requirements (who will provide instruction for students) in the various areas of the computers in instruction plan:
  - all classroom teachers,
  - select classroom teachers with special training,
  - a computer specialist.

7. **Evaluation**

Before a district computer education plan is finalized it should be evaluated by the committee. The following questions may be used in this process.

a. Does the computer education plan fit in adequately with the district curriculum and educational philosophy?

b. Does the plan clarify for students, staff, and community the philosophy, mission, and goals of computer education in the district.

c. Does the plan include a process for verifying that what is being offered is important, worthwhile, and accepted by the various groups in the district?

d. Is the plan realistic in light of resources available, and does it have a good chance of success?

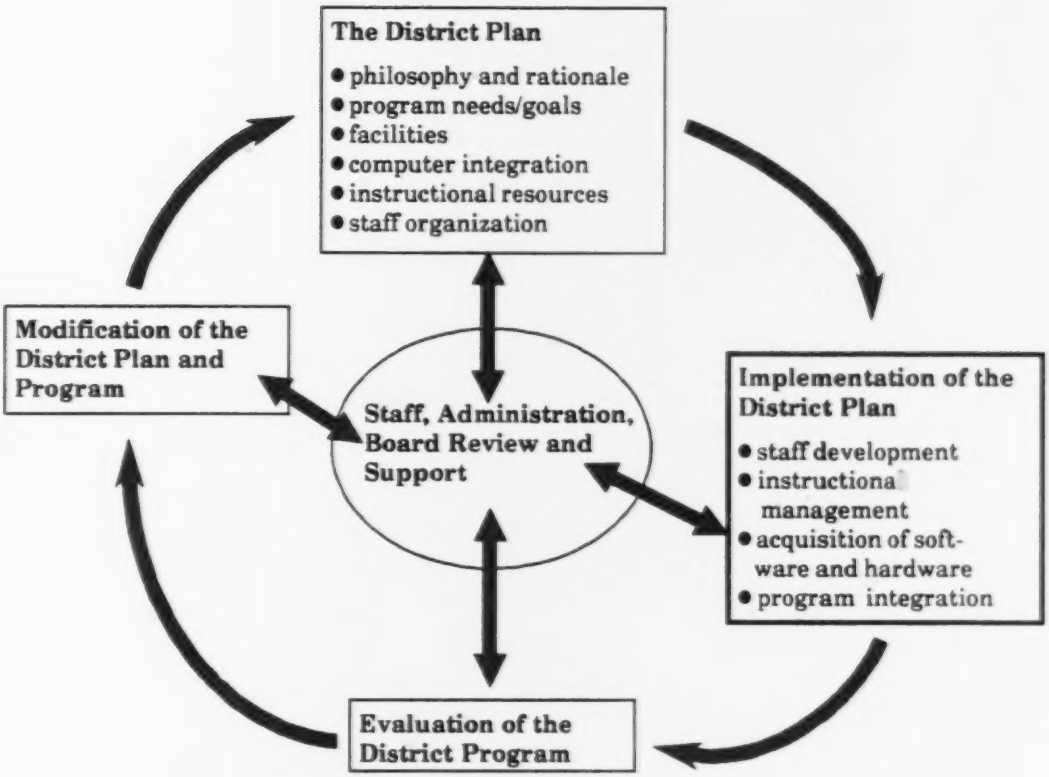
e. Does the written plan allow for:

1. assessment of needs?
2. planning?
3. implementation?
4. evaluation?
5. reporting to the public?

f. Does the plan allow for review and revision as some goals are achieved and new needs are identified?

CHAPTER 4

IMPLEMENTATION OF THE DISTRICT PLAN



A. STAFF DEVELOPMENT

1. Rationale

Staff development programs are the most important vehicles for integrating the use of computers and other current technologies into school district programs. Teachers and administrators in the field,

old and new, have a variety of fears, hopes, and ideas about the uses of computers and how they and their students will be affected by them. Because instructional computing is very new and may require new skills, some teachers may be intimidated by computers and reluctant to use them in their classrooms. Conversely, other teachers may naively feel the computer is just another piece of equipment, and that all they have to learn to do is plug in some software and let the kids go. The truth lies somewhere between these two extremes. The enthusiastic and uniform acceptance of computers in a district will depend on a well-organized inservice program that provides a supportive atmosphere for all involved.

Teachers and administrators have the ability to make decisions about computer utilization with insight, knowledge, and experience. The primary goal of a staff development program in computer education is to enable teachers to use the computer creatively in the instructional program.

2. Content and Learning Outcomes

School districts have a responsibility to provide development opportunities through which staff can acquire a functional knowledge of computers and their applications and learn how to integrate them into the classroom learning environment. These opportunities cannot be provided with a one- time inservice activity. They must be continuous and on-going. As current technologies continue to evolve, so must the knowledge base of all teachers. The widespread impact of computer technology requires the participation of all staff, not just those with an interest.

These staff development opportunities should be district supported, on- going activities designed to meet the varying needs of teachers in all disciplines and levels of instruction. They should be structured to address the following three areas of competence:

Introductory concepts

General understanding of social and economic effects of computers and how technology is influencing the changes occuring in society today.

Basic knowledge of how computers work, common computer terminology, and various applications of computers, including how computers are used in everyday living, transportation, communication, merchandizing, banking, business, and manufacturing.

Understanding the computer as a tool in computer-aided learning, including evaluation of software and classroom implementation strategies.

Exposure to a programming language, including the writing of simple programs in Logo or BASIC.

General Applications

Ability to use application software such as word processing programs, data bases, and spread sheets.

General understanding of computer applications used in various occupations related to content areas.

Specific Content-Area Application

An understanding of computer applications utilized in occupations related to the specific content area.

A working knowledge of computer applications which may be used in instruction for a specific content area.

Experience using the computer in all aspects of computer-aided learning.

Ability to plan, implement, and evaluate activities which integrate the computer into classroom instruction.

It is recommended that teachers become competent in all three of the above areas, with the introductory concepts being pre-requisite to the other two. Instruction in the introductory concepts will require a minimum of 15 to 20 contact hours and will include "hands on" experience. Competence in the general applications area should not be seen as a prerequisite to learning about specific content-area applications.

Training must include discussion of ways to effect change in the educational environment. Topics such as learning how to restructure curricular content to accommodate current and future technologies, making methodology changes to accommodate the use of computers within existing curricula, and determining the uses of computers for classroom management must be addressed. Activities must help all staff integrate

computers appropriately into the classroom in a manner that builds on the successes of existing programs.

3. Organization of Staff Development Programs

Computer-oriented staff development programs must be created to accommodate the unique needs of individual school districts while maximizing their resources. They must be creatively designed and effectively communicated if the retraining challenges presented by the technologies of the information age are to be met. As discussed in the previous section, these programs should address three areas of competence: introductory concepts, general applications, and specific content-area applications.

In addition, school districts should consider a variety of staff development activities to meet individual, small group, or large group needs. Appropriate and cost effective methods should be used to address the particular needs identified. Examples which address various levels of needs are:

Individual needs:

- attendance at conferences,
- visitations to other districts,
- consultation with resource people,
- workshop participation,
- college or university courses,
- independent work;

Small-group needs:

- attendance at conferences,
- visitations to other districts,
- meetings with resource people,
- workshop participation,
- workshop participation,
- college or university courses,
- summer workshops;

Large-group needs:

- inservice day,
- summer workshops,
- in-district college or university courses.

Why should educators make the considerable commitment of time and energy required to acquire a functional knowledge of computer technology? Motivation and interest are key ingredients in all education programs. In many cases, professional pride and interest, as well as concern for students, are enough to insure the success of the comprehensive staff development effort needed. However, other incentives must be provided. The following is a list of incentives that have been used successfully in Wisconsin schools:

- stipends,
- release time,
- conference attendance,
- visits to other schools/facilities,
- board credit,
- college or university credit,
- CEUs.

Additional resources used as incentives have been:

- hardware access,
- software budget increases,
- other media,
- resume enhancement.

Many educational innovations have failed to impact on education as originally hoped because of a failure to provide adequate training opportunities for the instructional staff. In dealing with information-age educational needs, a strong, innovative staff development program is needed to assure the future of the American educational system.

B. INSTRUCTIONAL MANAGEMENT

The way the computer is used in the educational setting is determined by the amount of hardware available, the type of software used, and the district philosophy. There are various techniques for using computers in the curriculum that may be considered. It should be noted that the size of the groups that can effectively work on one computer simultaneously depends on the program being used and the desired objectives. Groups of three or four students may be very productive if the program is designed for active involvement of all participants. If the program is designed for one or two students, it is important that the other students remain involved in other learning activities while they wait for their turn on the computer.

Individual mode of instruction

The computer is used as a supplement to a regular classroom program with enrichment or remedial work. Students are assigned computer programs which fit their achievement levels after the material has been presented to the entire class. This is an excellent way to meet individual needs, but does require software that can be used at many different levels.

Large-group mode of instruction

The computer is used as a demonstration or class discussion tool. This allows the introduction of special topics and give the teacher the ability to control input in a demonstration to achieve an objective and to make certain that all significant points are covered.

Small-group mode of instruction

The computer is used as an integral part of daily classroom presentation. The instruction for the day may include student use of a particular computer program with a set educational objective. Students in small groups may cooperate in the decision-making process or the program may be used on an individual basis.

In computer-aided learning, the computer does not dictate the curriculum. Computers do certain things well and fit into established curricula. Educators should determine their curriculum first and then consider how computers fit into the instructional objectives and activities of that curriculum.

C. SOFTWARE SELECTION, ACQUISITION, AND MANAGEMENT

a. Selection and evaluation

To achieve the full potential of a computer system, it is critical to evaluate and select software carefully. The process of evaluating and selecting computer software should be like that used to review any instructional media. The main considerations should be:

1. Educational content

   - Does it fit the grade level intended; what is the readability level?
   - Is the content accurate?

- Is it keyed to some of the instructional objectives of the course for which it is intended?
- Is it free of sex and ethnic biases?
- Are there adequate examples for the student to follow?
- Is there a logical sequence to the presentation?
- Is it free of spelling, grammar, and punctuation errors?
- Has course software been classroom and student validated?

2. Presentation format

   - Does the software create an appropriate use of the computer?
   - Is the reinforcement used in the software appropriate, for example:
     - immediate and not delayed?
     - sound used in a positive way?
     - interesting visuals?
   - Are the directions clear and precise?
   - Does the spacing make the screen easily readable?
   - Is the program interesting and not repetitious or boring?
   - Is there a screen delay which is disconcerting?
   - Does it use upper- and lower-case print?

3. Interactivity of computer program

   - Is it a creative use of the computer?
   - Are responses personalized with the student's name?
   - Are cues and prompts clear and in places where they are needed?
   - Is provision for help readily available and accessible?
   - Are the pace and sequence well controlled?

4. Teacher use

   - Does the printed documentation contain:

     - instructional objectives?
     - grade-level designation?
     - clear directions for use?
     - suggestions for related activities?
     - validation information?

   - Is the package appropriate for educational use?

   - Is record keeping possible?

   - Is it possible to make or obtain a back-up copy?

A number of organizations have developed forms for software evaluation. Those recommended are included in Appendix C of this document. These forms should be helpful as a district develops its own set of criteria for computer coursework selection.

2. Management Procedures

All computer software purchased by a district should be cataloged and processed (inventoried) in the same manner as all other media in the district, no matter what source of funding is used for purchase. This is important for a number of reasons:

a. Cost effectiveness

   1. It is essential that the district maintain an overall inventory of computer software to avoid unnecessary duplication. Multiple copies of software may very well be necessary, but duplication should be a specific decision and not a "happening."

   2. Some software is marketed with the same title or similar title by more than one company at vastly different prices. One person in the district (ideally the district media director) should have the responsibility of checking purchase requests against the district's inventory to avoid unnecessary duplication.

   3. All software owned by a district should have district ownership labels and other necessary markings applied in a consistent manner to help avoid theft and loss, and to insure easy inventory at the end of the school year.

b. Best overall use of district resources.

Some software can easily be shared between buildings or between teachers in a building. This software is the type that would be used for a short term in a classroom, as are certain sound filmstrips or ITV programs. Other computer software will have to be checked out on permanent loan to a specific department, building, teacher, or administrator or to the program for which it was purchased. The district media director and building media specialist, along with those requesting the software, should make the decision as to where software will be housed; but it should all be centrally inventoried for better overall use of district resources. In other words, the concern is not so much where the software is housed but that it first be centrally inventoried.

c. Collection growth.

At present, most school districts have a limited collection of computer software; but this collection is likely to grow rapidly in the next few years. This potential proliferation of software makes it even more important for district inventories to be kept from the very beginning of computer software collection development. If buildings or individuals request software already owned by the district, they can discuss the merits and disadvantages with those who are already users of the software, have an opportunity for hands-on experience, and make better informed judgments.

3. **Copyright Issues**

Public Law 96-517, which Congress passed in December of 1980, amends a common copyright law to grant the owner of a particular computer program the right to copy it if, and only if, (1) such a copy is "an essential step in the utilization of the program in conjunction with a machine," or (2) the copy is for archival purposes only, i.e. to serve as a back-up in case the original is lost or destroyed." Together, these exemptions are known as the "fair use" doctrine.

Some copying, then, is perfectly legal; the law as it now stands adequately responds to the need for back-up copies to protect the original investment in software. But that is where the line is drawn. A school may not purchase one copyrighted-computer program and reproduce it in quantity for use with several computer systems without the express permission of the copyright owner. This practice is a violation of federal law.

If educators duplicate software that is copyrighted, it is possible that the commercial producers of educational software will not be able to recoup their original investment; and if the profits from writing and marketing educational software dry up, so may the potential supply of quality software.

D. HARDWARE SELECTION, ACQUISITION AND MANAGEMENT

1. Selection Guidelines

a. Assessing needs

A list of the district's present and future needs, in line with the capabilities of the computer, is a good place to start. It is important to remember in this assessment that in most cases a computer can only use the programs designed to run on that make or type of computer. So, if classroom instruction is the main use intended for the computer, it is necessary to investigate the available software before making a hardware decision.

b. Factors to consider in selecting hardware:

1) What present and future instructional uses or applications are planned for the hardware?

2) What **software** is available for the uses planned for the computer? How good is the software and what do the reviews say about it?

3) What are the immediate **costs** of the equipment planned for purchase? What are the costs of expanding or upgrading the system? How about interfaces and connections?

4) What **peripherals** are available to communicate with the computer or to increase its usefulness (i.e. printers, disc drives, light pen, graphics, tablet, game controller, modem)?

5) What is the **memory** capacity of the computer? Does it match the memory requirements of the desired software? How much does additional memory cost? What is the maximum amount of memory the computer can support?

6) What **languages** come with the computer? What other languages are available and how expensive is each additional language?

7) Is the **video display** terminal attached to the keyboard or is it separate? Can additional monitors be attached to the computer?

8) Is the **keyboard** laid out in standard typewriter style? What is the feel of the keyboard? Does the keyboard have special keys for specific purposes (i.e. graphics, data entry, text editing, programmable keys)?

9) Does the computer have **special features** which may be needed, such as graphics capabilities, sound and music, etc.? If not, can they be added?

10) What **documentation** is available for using the computer? Is it written for the novice or only for the technically oriented?

11) Is the equipment **user friendly**? Is the computer easy to use?

12) What are the **physical dimensions**? How much does the computer weigh? Can it be easily transported between classrooms?

13) What consulting services are available to the district for the hardware being considered?

A hardware evaluation checklist appears in Appendix C.

2. Maintenance

Factors to consider:

- What warranties are available?
- Can the unit be serviced where it is purchased?
- Is on-site servicing available?
- Can local technicians make necessary repairs?
- Can the unit be updated for the next year to reflect refinements?
- How long does it take for service, including transportation to and from the service facility?

- What is the service charge, including transportation?

- Are agencies such as CESAs (cooperative educational service agencies) providing repair service for the hardware being considered?

3. **Security**

In an attempt to make the equipment as accessible as possible to all potential users, schools should adopt policies and procedures for the security of equipment, including plans for check-out to teachers for use at home.

Computer hardware should be inventoried and labeled in the same manner in which a district or building handles all other audiovisual hardware and equipment. One of the easiest and most cost-effective means for deterring theft, aiding insurance claims, and reclaiming stolen property is making ownership obvious and keeping up-to-date, readily-accessible inventories.

As schools become mass consumers of computer equipment, they also become a lucrative target for theft. Theft or vandalism of equipment can mean severe loss of money, staff time, and program "up" time.

The Wisconsin Educational Media Association (WEMA) has recently published a manual on microcomputer security. It is available for $8.00 from:

Wisconsin Educational Media Association
c/o Don Jorgensen
McKinley I.S.C.
812 North 10th Street
Manitowoc, WI 54220

4. **Safety and Ergonomics**

This involves a wide variety of factors, including reduction of glare on the monitor screen, tables of appropriate height for comfortable keyboard use, sensitivity to the length of a work session, and awareness of the debate over potential health hazards.

E. PROGRAM INTEGRATION

1. Scope and Sequence

As stated in the preface, knowledge of the computer is basic to an understanding of the full range of procedures that may be applied to organizing information and solving problems in many fields. Through the integration of computer technology as an effective instructional tool in many disciplines students may achieve a level of competency in many of the computer education areas designated in the scope and sequence shown below. Careful revision and adaptation of curriculums in various disciplines to build the necessary skills for an information age society will also lead to student achievement in computer education. Possible grade spans for introductory, developmental, and review activities are indicated. These designations have been made based on the level of student readiness for the activity and a representative cross sampling of what computer-literate districts are doing across the country. Local districts may use this table as a guide for deciding which of these various components may best be introduced to meet local needs. A local curriculum development committee will likely wish to state the learning outcomes more fully. The chart is necessarily abbreviated.

SCOPE AND SEQUENCE

I = Introduction
D = Development
R = Review for mastery

STRANDS	READINESS FOR			
	K-3	4-6	7-9	10-12
HISTORY AND SOCIAL IMPACT				
History of computers and why they exist	I	D	D	D
How computers affect people's lives	I	D	D	D
What a computer can do	I	D	D	D
Careers	I	D	D	D
Artificial intelligence		I	I/D	D
Information in society		I	D	D
Everyday applications	I	D	D	D
Future implications: social, educational, ethical		I	D	D
Robotics	I	I/D	D	D

STRANDS	READINESS FOR			
	K-3	4-6	7-9	10-12
COMPUTER CONCEPTS AND OPERATIONS				
What is a computer?	I	D	D	R
Definitions (vocabulary)	I	D	R	R
Learning to use a computer	I	D	D	R
Using the keyboard	I	D	D	R
Inputting, outputting, saving data	I	D	R	R
Executing programs	I	D	R	R
Computer characteristics, advantages, and disadvantages	I	D	R	R
Hardware: definition and use (peripherals)	I	D	D	R
Using prepared software (discs & cassettes)	I	D	D	R
PROBLEM SOLVING AND APPLICATIONS				
Data bases: introduction, prediction, generalization of data, statistical analysis		I	D	R
Sampling techniques			I	D
Statistical application			I	D
Information retrieval (on-line database searching)	I	D	D	D
Word processing		I	D	D
Electronic spread sheet				I/D

STRANDS	READINESS FOR			
	K-3	4-6	7-9	10-12
PROGRAMMING Programming programmable devices	I	D		
LOGO				
Turtle graphics: direction, distance, angle	I	D	D/R	
Squares, triangles, circles	I	D	D/R	
Procedures: repeated & combined	I	D	D/R	
Polygons and curves	I	I/D	D/R	
New shapes and characters	I	I/D	D/R	
Counting	I	I/D	D/R	
Editing procedures	I	I/D	D/R	
Coordinates	I	I/D	D/R	
Random numbers	I	I/D	D/R	
Numbers and arithmetic	I	I/D	D/R	
Words and lists	I	I/D	D/R	

STRANDS	READINESS FOR			
	K-3	4-6	7-9	10-12
BASIC				
Flowcharting		I	I/D	D
Formulas (variables and constants)		I	I/D	D
String data		I	I/D	D
Relations		I	I/D	D
Looping	I	I	I/D	D
Graphics		I	I/D	D
Arrays (one-dimensional)		I	I/D	D
Functions		I	I/D	D
Algorithms		I	I/D	D
Arrays (two-dimensional)		I	I/D	D
Matrices		I	I/D	D
Files		I	I/D	D
PASCAL, COBOL, and other language, as determined by the district curriculum			I	D
Assembler/machine language				I/D
Computer Systems			I	D
Design logic			I	D
Systems design			I	D

2. Keyboarding

As younger and younger children begin to use and experiment with computers, their lack of keyboarding skills becomes a concern for educators. Keyboarding has been defined as the act of inputting information into various types of equipment throught the use of a typewriter-like keyboard. In addition to young children's lack of such skills, educators are concerned about the possible development of improper, hunt-and-peck typing styles that can be hard to correct and may impede the development of a normal typing speed.

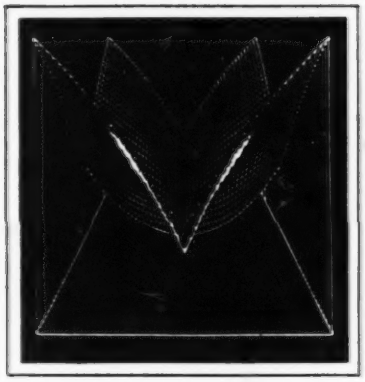
Generally speaking, young students' lack of keyboarding skills will not adversely affect future performance unless they are expected to use word processing or other programs that require the inputting of a great deal of textual information. With the advent of powerful and inexpensive word processing software designed for children and the use of these programs at the elementary and junior high school levels, however, the question of keyboarding skills must be addressed.

There are two practical ways to teach children basic keyboarding skills.

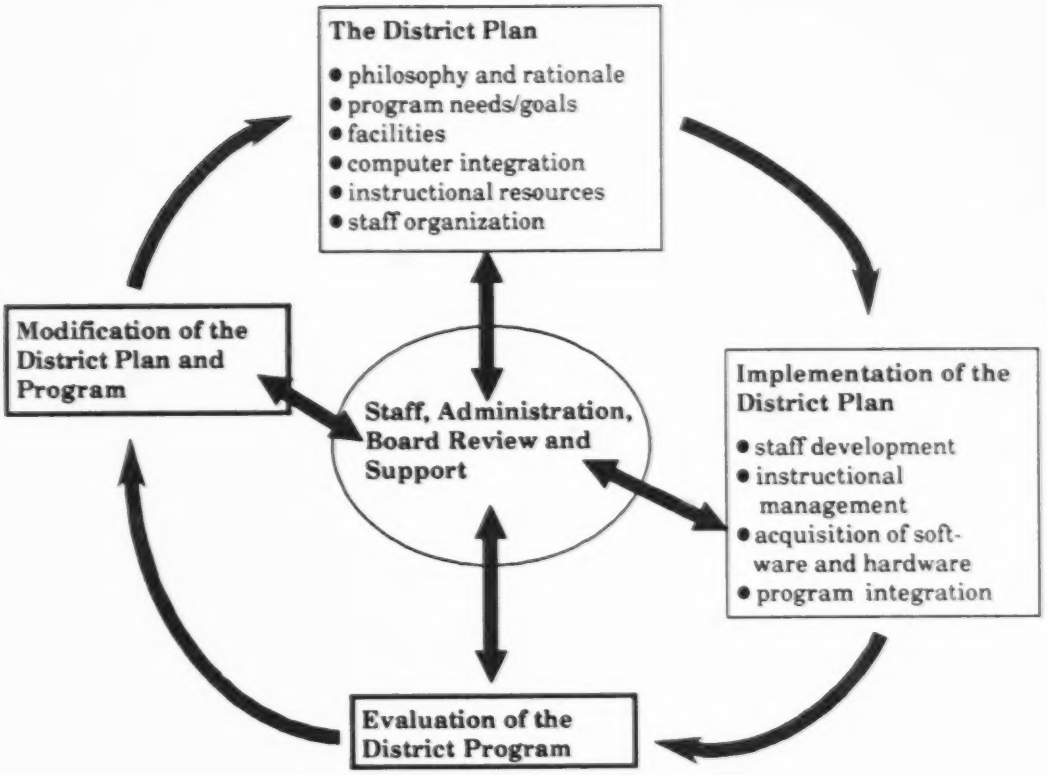
a. A hands-on student training program, emphasizing proper hand placement, fingering, and basic touch typing skills, can be organized through a school's business education/typing department. The program can be conducted by typing teachers themselves or by regular teachers trained in a typing workshop or a program designed to teach keyboarding skills to children.

b. If the above approach is not possible, regular classroom teachers can use electronic typing tutor programs, selected with the help of their school's business education/typing department, to teach students keyboarding skills. There are several excellent electronic typing tutor programs designed for younger children on the market. The help of typing teachers should be sought when selecting such programs. The ones to look for are those that emphasize very basic skills, such as hand placement and proper fingering, rather than those designed to increase typing speed. Generally, the arcade-style, "shoot-'em-up" programs are designed to increase typing speed, and thus are not the best kind to start with, though they may help improve student motivation later on. After students begin using a word processing program regularly, it is a good practice to reinforce proper typing skills periodically by having them input a few exercises from the electronic typing program before they begin the word processing program.

CHAPTER 5



EVALUATION AND MODIFICATION OF THE DISTRICT PLAN



Successful computer education programs show visible evidence of computers being integrated into the life and learning of the classroom, rather than being limited to use during a small amount of directed class time. Where computers have been effective, the teacher has often arranged for computers to be accessible to students on a flexible basis so that they may serve as resources in a wide range of subject matters, as well as teaching computer literacy for its own sake.

Questions based on the following statements may be of help in evaluating all aspects of the district plan.

A. There exists a systemwide implementation plan for computers.

1. Does the district now have a long-term plan for acquisition and introduction of computers and computer-related software? Does it include maintenance and teacher education?

2. If not, is such a plan anticipated or in preparation?

B. The school system itself–including teachers, students, parents, and the larger community–judges the program to be successful.

1. Do you think your computer education program is successful?

2. Does positive feedback come from teachers, students, parents, employers, and the community?

C. Students are motivated to engage in computer activities, even when not required.

1. Do students ask to use computers outside of class time?

2. Are regular hours for student use arranged, and is there substantial usage?

3. Are students allowed to take computers home overnight, on school vacations, or on weekends?

D. Non-technical teachers and non-science/non-math teachers are excited about the use of computers and incorporate them into their classroom activities on a subject-related or informal basis.

1. Who uses the computers in your school: specialists, math department, science department, business department?

2. Do elementary teachers use computers?

3. Do self-contained classroom teachers use computers?

E. Curriculum is modified to reflect the advantages offered by the new technology.

Has curriculum been revised to include use of computers? In what subject areas? For what grade levels?

F. Teachers work together to institutionalize and expand the use of computer-related instruction.

1. Do teachers work together to expand the use of computers?

2. Is there a user group–formal or informal–that meets in a school, in the district, or across districts?

3. Are teachers allowed to take computers home overnight, on school vacations, or on weekends?

G. The district provides funds for acquisition of hardware and software, teacher training, curriculum revision, and hiring of specialists and/or consultants.

1. Does the district spend its own funds for hardware/software, teacher education, curriculum revision, and hiring of specialists?

2. Does the district pay for release time for teachers to take courses?

3. Does the district offer inservice courses?

APPENDIX A

SUMMARY OF EQUITY ISSUES

Issues related to computer equity for students who are disadvantaged, female, or members of racial and/or ethnic minority groups fall into three areas: (1) access to computer literacy and computer-assisted learning; (2) tracking through differential uses of computer technology; and (3) exposure to bias and stereotyping in educational software. Key questions for each of these three areas follow:

1. ACCESS TO COMPUTER LITERACY AND COMPUTER-ASSISTED LEARNING

A. Do school districts with lower tax revenues have fewer computers than do districts with higher tax bases?

B. Are the schools with the fewest computers situated in neighborhoods where inhabitants have low socio-economic status and parents are less likely to have personal computers in their homes?

C. Within an individual school district, are there fewer computers in schools with less influential and/or less affluent parent groups?

D. How are the students selected for computer time? Are the computers considered more appropriate for certain groups of students on the basis of their academic achievement, sex, race/ethnic group, learning disability, or socio-economic level?

E. Is the math anxiety sometimes experienced by females transformed to machine anxiety that limits female students' access to computer technology?

F. What role do teacher and student expectations and stereotyping play in the selection of students for computer time?

G. Is there differential access to staff development activities so that teachers of certain groups (minority, handicapped, lower-achieving students) are less likely to have access to computer literacy and computer-assisted learning?

2. TRACKING THROUGH DIFFERENTIAL INSTRUCTIONAL USES OF THE COMPUTER

A. Are higher achieving students using the computers for simulations and development of higher order skills while special education students and lower achievers are restricted to drill and practice activities?

B. Are male students given opportunities to explore higher order skills and simulations while female students' opportunities focus primarily on word processing and record keeping?

C. Is time on the computer seen as a reward for certain groups of students and as a punishment for others?

D. Does the educational software emphasize one learning style that has a negative impact on certain groups of students on the basis of their race, ethnic group, sex, or cultural background?

3. EXPOSURE TO BIAS, STEREOTYPING, AND NEGATIVE VALUES INHERENT IN THE EDUCATIONAL SOFTWARE

A. Does the educational software use language that reflects bias on the basis of race, sex, ethnic group, or disability?

B. Does the educational software (text or graphics) reflect stereotyping on the basis of race, ethnic group, sex, or disability?

C. Does the educational software present the contributions of racial and ethnic groups and females and males in unrealistic and/or historically inaccurate ways?

D. Are females and minorities excluded or underrepresented in either the text or graphics of the educational software?

E. Does the educational software employ violence or extreme forms of competition for either instruction or for rewards for successful completion of the instructional task?

HUMAN VALUES CRITERIA FOR EVALUATING EDUCATIONAL SOFTWARE

Since most educational software evaluation forms do not contain criteria related to human values, the Mid-Atlantic Centers for Race and Sex Equity have developed these five items that can be incorporated into any software assessment. These criteria may be duplicated and used as long as credit is given to the centers.

1.	Is the language used in the educational software free from bias on the basis of race, sex, ethnic group, or disability?	Yes	No
2.	Are the text and graphics free from stereotyping on the basis of race, ethnic group, sex, or disability?	Yes	No
3.	Are women and minority group members proportionally represented in text and graphics?	Yes	No
4.	Are the contributions of all racial and ethnic groups and women and men presented in realistic and/or historically accurate ways?	Yes	No
5.	Is the educational software free from violence or extreme forms of competition?	Yes	No

Developed by
The Mid-Atlantic Centers for Race and Sex Equity
The American University
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Northwest Regional Educational Laboratory

microSIFT

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COURSEWARE EVALUATION PROCESS OVERVIEW

The process described here was designed during the 1980-81 school year as a framework for the evaluation of microcomputer-based instructional materials by the MicroSIFT clearinghouse. The components are a set of forms, the Evaluator's Guide, and a network of educational institutions.

The forms were based originally on the forms developed and used by the CONDUIT Project for evaluating computer-based instructional packages for post-secondary institutions. They were modified with additional concepts adopted from forms developed by the organizations and individuals. The "Courseware Description" form identifies the factual information necessary for evaluation and use of a package, including source, ability level, subject, mode of instruction, required hardware and software, instructional objectives and prerequisites. The "Courseware Evaluation" form is designed to be used after the information on the Description form is available. A copy of the rating portion is on the reverse of this page. In addition, it provides space for identifying major strengths and weaknesses, and suggestions for potential classroom uses.

The Evaluator's Guide is a book designed to be used by teachers and others who are evaluating courseware for MicroSIFT. It describes the use of the Description and Evaluation forms, and provides guidelines, suggestions and interpretations of each item on the Evaluation form.

The microSIFT Network is a group of over 20 educational organizations serving elementary and secondary schools with computer services and other types of support. The network includes school districts, regional service centers, state departments and state consortia which have experience in serving local districts with inservice, software, computer time and services, curriculum materials and evaluation services. They have staff whose time is assigned to supporting the instructional computing activities of schools in their geographic area.

The components above are used in the three stages of the process described below:

1. Sifting - This is a first look at a package to determine that it is instructional in nature, will actually operate without problems on the appropriate microcomputer, and is complete with instructions. MicroSIFT staff complete this phase of the process.

2. Description - A package passing stage 1 successfully is described in this stage using the Description form discussed above. The producer and MicroSIFT staff complete this stage for the most part. However, some information may be supplied in stage 3.

3. Peer Review - Teachers with experience in the subject and grade or ability level of the material are selected from schools served by a network site to evaluate packages according to the Evaluation form and Evaluator's Guide. A package is identified for a network site by MicroSIFT staff, and the teachers are selected by the instructional computing expert at the site. After the evaluations are completed by the teachers, an evaluation is also done by the network site expert, who also completes a summary review encompassing all three evaluations. The summary review becomes the MicroSIFT evaluation of the package.

Completion of the first three stages takes approximately three months. The resulting evaluations are professional opinions based on experience, and are not necessarily based on observation of student use of the packages. While some do include such use, the evaluators are volunteers, and their time does not always allow for extensive student involvement. Also, a package may be evaluated at a point in the school year not in conjunction with the time the topic is studied.

A fourth stage of evaluation in greater depth is desirable for some packages because of their complexity or breadth of curriculum coverage. Such a stage might include pre- and post-testing, detailed observation of student activity while using a package, or other procedures. This stage is not being implemented by MicroSIFT at this time, although some approaches for it are being developed and investigated.

microSIFT COURSEWARE EVALUATION

NORTHWEST REGIONAL EDUCATIONAL LABORATORY

Package title _____ Producer _____

Evaluator name _____ Organization _____

Date _____ ☐ Check this box if this evaluation is based partly on your observation of student use of this package

SA - Strongly Agree A - Agree D - Disagree SD - Strongly Disagree NA - Not applicable
Please include comments on individual items on the reverse page.

CONTENT CHARACTERISTICS

(1)	SA	A	D	SD	NA	The content is accurate.
(2)	SA	A	D	SD	NA	The content has educational value.
(3)	SA	A	D	SD	NA	The content is free of race, ethnic, sex and other stereotypes.

INSTRUCTIONAL CHARACTERISTICS

(4)	SA	A	D	SD	NA	The purpose of the package is well defined.
(5)	SA	A	D	SD	NA	The package achieves its defined purpose.
(6)	SA	A	D	SD	NA	Presentation of content is clear and logical.
(7)	SA	A	D	SD	NA	The level of difficulty is appropriate for the target audience.
(8)	SA	A	D	SD	NA	Graphics/color/sound are used for appropriate instructional reasons.
(9)	SA	A	D	SD	NA	Use of the package is motivational.
(10)	SA	A	D	SD	NA	The package effectively stimulates student creativity.
(11)	SA	A	D	SD	NA	Feedback on student responses is effectively employed.
(12)	SA	A	D	SD	NA	The learner controls the rate and sequence of presentation and review.
(13)	SA	A	D	SD	NA	Instruction is integrated with previous student experience.
(14)	SA	A	D	SD	NA	Learning can be generalized to an appropriate range of situations.

TECHNICAL CHARACTERISTICS

(15)	SA	A	D	SD	NA	The user support materials are comprehensive.
(16)	SA	A	D	SD	NA	The user support materials are effective.
(17)	SA	A	D	SD	NA	Information displays are effective.
(18)	SA	A	D	SD	NA	Intended users can easily and independently operate the program.
(19)	SA	A	D	SD	NA	Teachers can easily employ the package.
(20)	SA	A	D	SD	NA	The program appropriately uses relevant computer capabilities.
(21)	SA	A	D	SD	NA	The program is reliable in normal use.

QUALITY

Write a number from 1 (low) to 5 (high) which represents your judgement of the quality of the package in each division:

____ Content

____ Instructional Characteristics

____ Technical Characteristics

RECOMMENDATIONS

- ☐ I highly recommend this package.
- ☐ I would use or recommend use of this package with little or no change. (Note suggestions for effective use below.)
- ☐ I would use or recommend use of this package only if certain changes were made. (Note changes under weaknesses or other comments.)
- ☐ I would not use or recommend this package. (Note reasons under weaknesses.)

Describe the potential use of the package in classroom settings

Estimate the amount of time a student would need to work with the package in order to achieve the objectives:
(Can be total time, time per day, time range or other indicator.)

Strengths:

Weaknesses:

Other comments:

microSIFT COURSEWARE DESCRIPTION

NORTHWEST REGIONAL EDUCATIONAL LABORATORY

Title _____ Version Evaluated _____

Producer _____ Cost _____

Subject/Topics _____

Grade Level(s) (circle) pre-1 1 2 3 4 5 6 7 8 9 10 11 12 post-secondary

Required Hardware _____

Required Software _____

Software protected? ☐yes ☐no Medium of Transfer: ☐Tape Cassette ☐ROM Cartridge ☐5" Flexible Disk ☐8" Flexible Disk

Back Up Policy _____

Producer's field test data is available ☐on request ☐with package ☐not available

INSTRUCTIONAL PURPOSES & TECHNIQUES
please check all applicable

- ☐ Remediation
- ☐ Standard instruction
- ☐ Enrichment
- ☐ Assessment
- ☐ Instructional management
- ☐ Authoring
- ☐ Drill and practice
- ☐ Tutorial
- ☐ Information retrieval
- ☐ Game
- ☐ Simulation
- ☐ Problem Solving
- ☐ Other _____

DOCUMENTATION AVAILABLE
circle P (program) S (supplementary material)

- P S Suggested grade/ability level(s)
- P S Instructional objectives
- P S Prerequisite skills or activities
- P S Sample program output
- P S Program operating instructions
- P S Pre-test
- P S Post-test
- P S Teacher's information
- P S Resource/reference information
- P S Student's instructions
- P S Student worksheets
- P S Textbook correlation
- P S Follow-up activities
- P S Other _____

OBJECTIVES ☐Stated ☐Inferred

PREREQUISITES ☐Stated ☐Inferred

Describe package CONTENT AND STRUCTURE, including record keeping and reporting functions

SCHOOL MICROWARE EVALUATION FORM

(This form may be copied as needed; for additional information, see School MicroWare Vol. 1 No. 1)

Your Name_____ Organization_____ Position_____

Product Name_____ Supplier_____ No. of Progs. Under This Name_____ Price $_____

Applicable School
Dept/Subj/Topic _____

INSTRUCTIONS - For open ended items, supply all information requested in blanks provided if possible; use extra sheets if necessary. For objective items (those with blanks to left), enter a number in the blank to indicate the extent to which the program fulfills the description in the item, as follows: 2 - Completely, 1 - Partially, 0 - Not at All. If the item is not applicable to the program, enter N/A. If the item is unclear, enter U. Elaborate on answers as necessary in Comments section at end or on extra sheets, giving item numbers.

OVERVIEW - Describe the program briefly in terms of its goals and what it does to achieve them (no evaluation here).

_____

_____

PRELIMINARY CONSIDERATION - Assuming that this program contributes to the teaching of one or more topics, is that topic one which is or should be taught in today's schools? Yes No If not, give your reasons for this answer in the Comments section at the end of the form and omit the balance of the questionnaire.

DOCUMENTATION - List materials accompanying the program, e.g., teachers guide, student workbook.

1. Indicate types of information included.
   - a. Suggested course/subject, grade levels.
   - b. Goals.
   - c. Performance objectives.
   - d. Suggested teaching strateg(ies).
   - e. Correlation with standard texts.
   - f. Prerequisites for use of program.
   - g. Student exercises, teacher answers.
   - h. Operating instructions.
   - i. Listing and sample runs of program(s).
   - j. If a simulation, description of the model used.
   - k. Suggested topics for follow-up discussions.
   - l. Suggested references/activities for follow-up.
2. The documentation is written clearly.
3. If a workbook is included, the format and content are appropriate.

INSTRUCTIONS GIVEN TO USER BY PROGRAM

1. The instructions are adequate regarding:
   - a. The instructional task to be performed.
   - b. Details of how to interact with the program.
2. User has the option of skipping instructions if already known.

STUDENT-COMPUTER DIALOG

1. Output is displayed screen by screen (paged) rather than scrolled.
2. If output is paged:
   - a. User has control over continuing to the next page.
   - b. Amount of information in each page is appropriate.
   - c. The perceptual impact (amount of type and lines) is suitable.
3. Output is spaced and formatted so as to be easily readable.
4. Language is well suited to most students' reading ability.
5. Uses correct grammar, spelling, hyphenation and punctuation.
6. Any grid or coordinate system used is consistent with common conventions.
7. Students can respond with common symbols & ways of using them, e.g., right to left entry of sums.
8. Accepts abbreviations for common responses.
9. Provides for individual needs, e.g., opportunity to work with harder or easier material.
10. Dialog is personalized, i.e., makes appropriate use of student names.
11. Uses devices to get & maintain interest, e.g., variation of computer responses, humor, pace change, surprise.
12. Makes good use of any special features of computer:
    - a. Graphics
    - b. Color
    - c. Sound
13. Reinforcing responses (indications of right, wrong, etc.) are appropriate.
14. The number of wrong answers allowed is reasonable.
15. Responds appropriately if allowed number of wrong answers is exceeded.
16. Provides opportunity to get help if difficulty is encountered.
17. Minimizes bad entries via devices such as objective formats (multiple choice, etc).
18. Deals well with inappropriate entries, i.e., response to typing errors, etc., is intelligible and useful.
19. Required entries are within students' capabilities (esp. typing, vocabulary).
20. Reports student performance periodically and at end of session.

MISCELLANEOUS CONCERNS

1. If a simulation, the program gives a sufficiently accurate representation of the situation simulated.
2. The concepts and vocabulary required to use the program are reasonable.
3. Operates properly and is free of bugs.
4. Is well structured and documented internally to facilitate any necessary debugging/modification.

COMMENTS - Please use this space and additional sheets as necessary to provide any other information which you believe would help someone who was considering acquiring the program being reviewed. In particular, indicate what you like least and most about the program. Also, list any changes which should be made.)

_____

_____

Educational Software Evaluation Form

© Educational Alternatives, 1981

Program Name_____ Producer_____ Cost_____
Subject Area_____ Reviewer_____ Date_____

1. Describe the intended educational purpose:

2. Instructional Range:Grade levels_____Ability levels_____

3. Instructional Grouping: Individual____, Small group(size)_____large group (size)_____

4. Program uses: Drill and practice___ Tutorial___ Simulation___ Instructional Game___ Strategy game___
Problem solving___ Information Source___ Software tool(type)_____ Other_____

5. Comment on Appropriateness for Instructor:
To what extent does the program allow a teacher to adjust for different uses and different users?

To what extent does the program require teacher assistance?

What is the implied view of the learner and the learning process?

Is the program educationally appropriate?

6. Comment on Appropriateness for Student:
Are the directions clear?

Is it simple to use?

Is it developmentally appropriate considering physical, intellectual and emotional maturity?

Would most of your students enjoy using this program?___ If not, describe those who would.

7. Comment on:
The instructional significance of the program:

The compatability with educational philosophy, teaching style and curriculum generally encountered by the student:

Reviewer's Name_____

Program Name_____

8. What happens when a student makes a mistake in entering answers?

   What happens when a student makes a mistake in content?

9. Can the student get help from the program?

   Can the student review the instructions once the program has started?

10. To what extent is the user given choices?

    To what extent does the user feel in control?

11. Indicate the social characteristics present:

	present & negative	present & positive	not present
competition			
cooperation			
personification of the computer			
moral issues and value judgements			
appropriate inclusion of women& minorities			

12. Describe any unintentional learning, both positive and negative:

13. To what extent does the program use the computer's potential for interaction, immediate feedback, animation, color, music, sound, etc.?

14. To what extent does the program offer more than one mode of learning (visual, verbal, numerical, aural), in a way that reinforces and supports the learning focus?

15. In what ways (and under what circumstances) can this program provide students with a more effective learning experience than they could have had without a microcomputer?

16. Briefly support your reccomendation for_____ or against___purchase of this program by your school system:

SOFTWARE EVALUATION CHECKLIST

PROGRAM NAME: _____ SOURCE: _____ COST: _____

SUBJECT AREA: _____ REVIEWER'S NAME: _____ DATE: _____

1. INSTRUCTIONAL RANGE

_____ grade level(s)

_____ ability level(s)

2. INSTRUCTIONAL GROUPING FOR PROGRAM USE

_____ individual

_____ small group (size: _____)

_____ large group (size: _____)

3. EXECUTION TIME

_____ minutes (estimated) for average use

4. PROGRAM USE(S)

_____ drill or practice

_____ tutorial

_____ simulation

_____ instructional gaming

_____ problem solving

_____ informational

_____ other (_____)

5. USER ORIENTATION: INSTRUCTOR'S POINT OF VIEW

low				*high*	
•	•	•	•	•	flexibility
•	•	•	•	•	freedom from need to intervene or assist

6. USER ORIENTATION: STUDENT'S POINT OF VIEW

low				*high*	
•	•	•	•	•	quality of directions (clarity)
•	•	•	•	•	quality of output (content and tone)
•	•	•	•	•	quality of screen formatting
•	•	•	•	•	freedom from need for external information
•	•	•	•	•	freedom from disruption by system errors
•	•	•	•	•	simplicity of user input

7. CONTENT

low				*high*	
•	•	•	•	•	instructional focus
•	•	•	•	•	instructional significance
•	•	•	•	•	soundness or validity
•	•	•	•	•	compatibility with other materials used

8. MOTIVATION AND INSTRUCTIONAL STYLE

passive				*active*	
•	•	•	•	•	type of student involvement

low				*high*	
•	•	•	•	•	degree of student control

none	*poor*				*good*	
•	•	•	•	•	•	use of game format
•	•	•	•	•	•	use of still graphics
•	•	•	•	•	•	use of animation
•	•	•	•	•	•	use of color
•	•	•	•	•	•	use of voice input and output
•	•	•	•	•	•	use of nonvoice audio
•	•	•	•	•	•	use of light pen
•	•	•	•	•	•	use of ancillary materials
•	•	•	•	•	•	use of _____

9. SOCIAL CHARACTERISTICS

present and negative	*not present*	*present and positive*	
_____	_____	_____	competition
_____	_____	_____	cooperation
_____	_____	_____	humanizing of computer
_____	_____	_____	moral issues or value judgments
_____	_____	_____	summary of student performance

1. The grade levels and ability levels for a particular program are primarily determined by the concepts involved. Other important factors are reading level, prerequisite skills, degree of student control, and intended instructional use. It is possible for a program to be flexible enough to be used across a wide range of grade levels and ability levels.

2. Some programs are designed for use by individuals. Others have been or can be modified for participation by two or three persons at a time. Simulations or demonstrations often pose opportunities for large-group interaction. A given program may be used in more than one grouping, depending on the instructor.

3. The time required for the use of a program will vary considerably. Include loading time for cassettes. A time range is the appropriate response here.

4. Instructional programs can be categorized according to their uses. Some programs may have more than one use, thus falling into more than one of the following categories:

Drill or practice: Assumes that the concept or skill has been taught previously.

Tutorial: Directs the full cycle of the instructional process; a dialogue between the student and the computer.

Simulation: Models selected, alterable aspects of an environment.

Instructional gaming: Involves random events and the pursuit of a winning strategy.

Problem solving: Uses general algorithms common to one or more problems.

Informational: Generates information (data).

5. These are factors relevant to the actual use of the program from the point of view of an instructor.

Flexibility: A program may allow the user or the instructor to adjust the program to different ability levels, degrees of difficulty, or concepts.

Intervention or assistance: A rating of "low" means considerable teacher intervention or assistance is required.

6. These are factors relevant to the actual use of the program from the point of view of a student.

Directions: The directions should be complete, readable, under the user's control (e.g., should not scroll off the screen until understood), and use appropriate examples.

Output: Program responses should be readable, understandable, and complete. If in response to student input, the output should be of an acceptable tone and consistent with the input request.

Screen formatting: The formats during a program run should not be distracting or cluttered. Labels and symbols should be meaningful within the given context.

External information: A program may require the user to have access to information other than that provided within it. This may include prerequisite content knowledge or knowledge of conventions used by the program designer as well as maps, books, models, and so on.

System errors: System errors result in the involuntary termination of the program.

Input: A program should ensure that a user knows when and in what form input is needed. It should avoid using characters with special meanings, restrict input locations to particular screen areas, and require minimal typing.

7. These are matters relevant to the subject-matter content of the program.

Focus: The program topic should be clearly defined and of a scope that permits thorough treatment.

Significance: The instructional objectives of the program must be viewed as important by the instructor. Also, the program should represent a valid use of the computer's capabilities while improving the instructional process.

Soundness or validity: The concepts and terms employed should be correct, clear, and precise. Other important factors are the rate of presentation, degree of difficulty, and internal consistency.

Compatibility: The content, terminology, teaching style, and educational philosophy of the program should be consistent with those generally encountered by the student.

9. Competition, cooperation, and values are concerns that may be a function of the way a program expresses them. (War gaming and the "hangman" format are sample issues.) Also, the "humanizing" of the computer may serve for motivation or to reduce anxiety, but it also may become tedious, misleading, and counterproductive.

The summary of student performance can be dichotomous (win or lose), statistical (time expended or percent of items correct), or subjective (as in the evaluation of a simulation). It may be for student, teacher, or both.

Hardware Evaluation Worksheet

On the tally sheet below, assign an *importance factor* of 1 to 3 for each category, depending on how important you think each category is to your decision. The factor should be developed by your district committee and should be consistent as you rate various machines. **1 = Not important; 2 = Important; 3 = Very important.**

As you compare machines, give each one a *rating* of 1 to 3 in each category (**1 = Poor; 2 = Average; 3 = Good**). For example, if dealer service is not available, give it a 1 under the "Service" category; if it is good, give it a 3. If the machine is easily moved and compact, the "Flexibility" category may get a 2 or 3. If no software is available, that category may be given a 1.

When all the categories have been rated, multiply them by the importance factor you originally assigned. The end results are then added together. The highest total will indicate the microcomputer best suited for your uses. Be as sincere as possible to get an unbiased evaluation. Color of the case, unnecessary extras, or the salesperson's personality should not affect the choice.

SAMPLE:

Brand X

Category	Importance Factor (1 to 3)	Rating (1 to 3)	Total
Cost	3	2	6
Service	2	1	2
User Training	1	3	3

Brand _____

Category	Importance Factor (1 to 3)	Rating (1 to 3)	Total
Cost			
Service			
User Training			
System Expansion			
Flexibility			
Software			
Memory			
Keyboard			
Display			
Peripherals & Options			
Sound, Music, Voice, Graphics		66	

Total _____

Brand _____

Category	Importance Factor (1 to 3)	Rating (1 to 3)	Total
Cost			
Service			
User Training			
System Expansion			
Flexibility			
Software			
Memory			
Keyboard			
Display			
Peripherals & Options			
Sound, Music, Voice, Graphics			

Total _____

Brand _____

Cost			
Service			
User Training			
System Expansion			
Flexibility			
Software			
Memory			
Keyboard			
Display			
Peripherals & Options			
Sound, Music, Voice, Graphics			

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Total _____